

# REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing this collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports (0704-0188), 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. PLEASE DO NOT RETURN YOUR FORM TO THE ABOVE ADDRESS.

1. REPORT DATE (DD-MM-YYYY)		2. REPORT TYPE Technical Paper		3. DATES COVERED (From - To)	
4. TITLE AND SUBTITLE				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER BmDo	
				5e. TASK NUMBER SB RU	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)  Sierra Engineering				8. PERFORMING ORGANIZATION REPORT	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)  Air Force Research Laboratory (AFMC) AFRL/PRS 5 Pollux Drive Edwards AFB CA 93524-7048				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S NUMBER(S)	
12. DISTRIBUTION / AVAILABILITY STATEMENT  Approved for public release; distribution unlimited.					
13. SUPPLEMENTARY NOTES					
14. ABSTRACT  <div style="text-align: center; font-size: 2em;">20030103 130</div>					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT  A	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON Leilani Richardson
a. REPORT Unclassified	b. ABSTRACT Unclassified	c. THIS PAGE Unclassified			19b. TELEPHONE NUMBER (include area code) (661) 275-5015

Standard Form 298 (Rev. 8-98)  
Prescribed by ANSI Std. Z39.18

1 item enclosed

⊗ Paper Rec'd After 30-day Deadline = 24 days until Deadline NR

MEMORANDUM FOR PRS (In-House/Contractor Publication)

BMDOSBRU

FILE

FROM: PROI (STINFO)

F04611-01-L-0010

12 Nov 2002

SUBJECT: Authorization for Release of Technical Information, Control Number: **AFRL-PR-ED-AB-2002-282**  
J.A. Muss (Sierra) et al., "The Performance of Hydrocarbon Fuels with H<sub>2</sub>O<sub>2</sub> in a Uni-element  
Combustor" (abstract only)

Rich  
56177

AIAA Joint Propulsion Meeting  
(Huntsville, AL, 20-23 July 2003) (Deadline: 6 Dec 02)

(Statement A)

# The Performance of Hydrocarbon Fuels with $H_2O_2$ in a Uni-element Combustor

An Abstract for the 2003 AIAA/JPC

By

Jeff Muss, Curtis Johnson  
Sierra Engineering, Carson City NV  
William Kruse  
TRW, Redondo Beach, CA  
Richard Cohn  
AFRL/PRSA, Edwards AFB, CA

A team including Sierra Engineering, AFRL, and TRW tested several different hydrocarbon fuels in a 1200 pound thrust hydrogen peroxide/ hydrocarbon rocket uni-element combustor at the AFRL propulsion directorate Edwards AFB research site. Tests were conducted with a variety of hydrocarbon fuels, including JP-8, RP-1, JP-10, toluene, quadricyclane, and turpentine as well as a several mixtures of these listed fuels. The combustor used decomposed hydrogen peroxide at concentrations of 90% as the oxidizer. The water-cooled combustion chamber included significant fuel film cooling with an overall mixture ratio between 4 and 6. All testing was conducted at a chamber pressure of approximately 780 psia.

Figures of merit to be presented in this paper include characteristic velocity and energy release efficiencies. The experimental performance results were compared with computations performed by PERCORP, a program for predicting mixture ratio striations within the engine, and TDK. Agreement was generally excellent,  $C^*$  and ERE agreeing to within 1%.

During the course of testing, several chemicals normally not used as a rocket propellant were tested. This paper will also cover some of the operational issues regarding the use of these propellants in rocket propulsion testing.

**DISTRIBUTION STATEMENT A**  
Approved for Public Release  
Distribution Unlimited